

TITLE OF THE INVENTION
METHOD AND APPARATUS FOR REPRODUCING DIGITAL DATA
INCLUDING VIDEO DATA

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is based upon and claims the
benefit of priority from the prior Japanese Patent
Application No. 2003-053813, filed February 28, 2003,
the entire contents of which are incorporated herein by
reference.

10 BACKGROUND OF THE INVENTION

1. Field of the Invention

 The present invention relates, in general, to a
field of a data reproducing apparatus which reproduces/
outputs digital data such as digital video data,
15 particularly to a technique of a reproduction control
of reproduction prohibition object data included in
digital data.

2. Description of the Related Art

 In recent years, digital broadcasting for
20 broadcasting especially audio and video (AV) content in
a digital data form, or a service for distributing the
AV content via the Internet has spread. A service for
providing the AV content via recording media such as a
digital versatile disc (DVD) has also become general.

25 On the other hand, development of a digital
recording/reproducing system has been promoted such as
a home server in which individual apparatuses including

a conventional personal computer, various digital recording/reproducing apparatuses, and a television set are integrated. With this home server, an environment is realized in which the AV content is easily provided
5 via the digital broadcasting, the Internet, or any of recording media.

Additionally, when AV data constituting the AV contents of the digital data form is reproduced/output (screen display or sound output), there is a
10 possibility that scenes in which video or sound content makes audiences feel uncomfortable or is not good for children from an educational standpoint are displayed. These AV data include not only represented content but also video which has a so-called subliminal effect.

15 A prior art for removing subliminal video included in the AV data has heretofore been proposed (e.g., see Jpn. Pat. Appln. KOKAI Publication No. 9-284667).

A reproducing apparatus of the AV data is required to have a function capable of executing a reproduction
20 output control to remove or change a part of the data included in the AV data because the data is unpleasant for the audiences or is unfavorable from an educational standpoint. For the function of removing the subliminal video, the above-described prior art has
25 been proposed.

However, a function of controlling the reproduction/output to remove data having a data

pattern identical or similar to that set beforehand as a reproduction prohibition object from the digital data which is a reproduction object has not been concretely realized.

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BRIEF SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention, there is provided a data reproducing apparatus to reproduce digital data from which data of a reproduction prohibition object has been removed.

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The present data reproducing apparatus includes: a buffer memory which stores digital data of a reproduction object; a storage unit which stores data for determining to identify a reproduction prohibition object data pattern; a determining unit which uses the data for determining to determine whether or not the digital data stored in the buffer memory includes the reproduction prohibition object data pattern; and a control unit which processes data corresponding to the reproduction prohibition object data pattern in accordance with a determining result of the determining unit and executes reproduction processing of the digital data except for the reproduction prohibition object data pattern.

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention, and together

with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

FIG. 1 is a block diagram showing a constitution of a data reproducing apparatus in accordance with a first embodiment of the present invention;

FIG. 2 is a flowchart showing a procedure of a reproduction control operation in accordance with the first embodiment;

FIG. 3 is a flowchart showing the procedure of the reproduction control operation in accordance with a second embodiment; and

FIG. 4 is a block diagram showing the constitution of the data reproducing apparatus in accordance with a third embodiment.

DETAILED DESCRIPTION OF THE INVENTION

(First Embodiment)

A first embodiment will hereinafter be described with reference to the drawings.

FIG. 1 is a block diagram showing a major part of a digital reproducing system 100 including a data reproducing apparatus in accordance with the present embodiment.

The digital reproducing system 100 receives a video signal (digital stream data) VS transmitted, for example, via the Internet, reproduces the signal, and outputs the signal to a display device 18. The display

device 18 displays reproduced video (also including a static image) on a display, and outputs sound via a speaker.

5 The data reproducing apparatus includes a buffer memory 10 of a first-in first-out (FIFO) type which receives the stream data VS, direct memory access (DMA) controllers 11, 14, a field memory (frame buffer) 12, and a flash memory 13.

10 The DMA controller 11 transfers the stream data stored in the buffer memory 10 to the field memory 12 by a frame unit. The field memory 12 stores digital data by a field unit (e.g., for several frames). The DMA controller 14 transfers the data stored in the field memory 12 to an NTSC circuit 17 described later.
15 The flash memory 13 stores, for example, a substitute data pattern for a prohibition object data pattern.

 Furthermore, the data reproducing apparatus includes an on screen display (OSD) circuit 15, a switch circuit 16, the NTSC circuit 17, and a
20 controller 19 which executes a reproduction control. The OSD circuit 15 produces a data signal for superimposition of character pattern data. The NTSC circuit 17 outputs a television video signal and a sound signal of a National Television System Committee
25 (NTSC) system to the display device 18.

 The controller 19 includes a microprocessor (CPU) 20, an image processing unit (also referred to as a

filter) 21, and a database 22. The CPU 20 executes a reproduction control in accordance with the present embodiment as described later (see FIGS. 2 and 3).

5 The image processing unit 21 compresses/processes image data (screen data) which is the data pattern extracted by the CPU 20 to produce the data pattern which is a comparison object. Furthermore, the image processing unit 21 processes the image in order to compare the produced data pattern with a data pattern
10 for determining (data pattern of the reproduction prohibition object) included in the data for determining stored in the database 22. The image processing unit 21 is concretely software executed by the CPU 20 or dedicated hardware.

15 The database 22 means a storage device in which the data for determining indicating reproduction prohibition conditions is stored, and software for retrieving the data for determining. The data for determining includes the data pattern for determining
20 to determine the prohibition object data pattern to be prohibited from being reproduced. The data pattern for determining is compressed screen data such as a compressed thumbnail.

(Operation of Reproduction Control)

25 A procedure of a reproduction control operation in accordance with the present embodiment will hereinafter be described with reference to a flowchart of FIG. 2

together with FIG. 1.

The data reproducing apparatus stores the received stream data VS in the field memory 12 (step S1). Here, in the present embodiment, only video data is an object to be handled in a stream of AV data.

The CPU 20 uses the image processing unit 21 to execute image recognition processing with respect to data (e.g., image data for several frames) stored in the field memory 12 (step S2). Concretely, the CPU 20 detects an edge of an image (change point of brightness) to obtain contours of the object. The CPU 20 further produces shape data pattern formed of the obtained contours (step S3).

The CPU 20 uses the image processing unit 21 to change the produced shape data pattern to compressed data. The CPU 20 retrieves the database 22 for the data for determining to determine whether or not the data pattern for determining agreeing with the shape data pattern exists (steps S4, S5).

In the database 22, the data pattern for determining is stored to determine the prohibition object data pattern set beforehand as the reproduction prohibition object. Examples of the data pattern for determining include a data pattern by which the data pattern set as the reproduction prohibition object such as a so-called adult image can be detected.

The CPU 20 determines a degree of similarity of

the produced shape data pattern with respect to any of the data patterns for determining stored in the database 22 based on a result of image processing of the filter 21 and a predetermined threshold value (threshold value for determining of similarity of an image pattern). The CPU 20 executes a predetermined reproduction control, when the determining result indicates the identity or the similarity (YES in step S5, S6).

10 Concretely, the CPU 20 removes the data (part of video data) determined as the reproduction prohibition object data pattern by the determining result from the received stream data VS, and transfers the stream data to the NTSC circuit 17.

15 At this time, the CPU 20 controls the switch circuit 16 to transfer character pattern data notifying that, for example, the adult image is removed from the OSD circuit 15 to the NTSC circuit 17. Accordingly, the video is displayed/output and a comment including a character string is superimposed on the screen of the display device 18. Accordingly, a user can confirm the video reproduced from the received stream data VS and the comment indicating that, for example, the adult image has been removed from the video on the screen of the display device 18.

25 Moreover, the CPU 20 may also execute a control so as to extract the substitute data pattern for the

prohibition object data pattern removed from the stream data VS from the flash memory 13 and to transfer the pattern to the NTSC circuit 17.

5 On the other hand, the CPU 20 executes normal reproduction output processing to transfer the stream data to the NTSC circuit 17, when the stream data stored in the field memory 12 does not include the reproduction prohibition object data pattern (NO in step S5, S7).

10 In the present embodiment, the CPU 20 determines the reproduction prohibition object data pattern to be extracted from the stream data based on the shape pattern of the image. Additionally, the CPU 20 may also execute a control so as to prohibit the
15 reproduction/output of so-called flash video as the reproduction prohibition object data by an algorithm in which integration of a luminance or color difference signal is periodically compared.

20 Moreover, the CPU 20 may recognize/process the character pattern included in the screen and determine a character pattern string in which characters are unfavorably represented as the reproduction prohibition object data pattern based on the character recognition result (including the similarity). In this case, a
25 standard integrated value of the luminance or color difference signal constituting the prohibition object, or the recognition result constituted of the character

string constituting the prohibition object is stored beforehand in the database 22.

(Second Embodiment)

FIG. 3 is a flowchart showing the procedure of the reproduction control operation in accordance with a second embodiment. In the data reproducing apparatus of the present embodiment, the so-called adult image is extracted from the stream data, and processed as the reproduction prohibition object data. Concretely, the present embodiment relates to a method in which image recognition processing, inference algorithm, and pattern matching processing by use of the database 22 are combined. The method will hereinafter be described with reference to the flowchart of FIG. 3.

The data reproducing apparatus stores the received stream data VS in the field memory 12 (step S11). The CPU 20 uses the image processing unit 21 to execute image recognition processing with respect to the data (e.g., image data for several frames) stored in the field memory 12 (step S12).

First, the CPU 20 detects the edge of the image (change point of brightness), and obtains the contours of the object. The CPU 20 extracts a person based on the shape pattern constituted of the contours. Concretely, the CPU 20 determines whether or not a portion corresponding to a face exists from the shape pattern. The CPU 20 also determines whether or not

color information corresponding to color of skin exists. The CPU 20 further presumes the person from a positional relation of parts such as face, body, and limbs.

5 When the existence of the person cannot be presumed from the image data by the extraction processing of the person, the CPU 20 shifts to normal reproduction output processing with respect to the stream data (NO in step S13, S21). On the other hand,
10 when the person can be extracted, the CPU 20 shifts to inference processing for determining whether the person is a child or an adult (YES in step S13, S14).

 In this inference processing, the CPU 20 calculates information such as a ratio (life size) of
15 the head, limbs, and body constituting the person, coordinate information of eyes and nose, and track and speed of movement of the limbs, and determines whether the extracted person is a child or an adult based on a calculation result (step S15). The CPU 20 determines
20 that the extracted person is the child, and then shifts to normal reproduction output processing with respect to the stream data (NO in step S15, S21).

 On the other hand, the CPU 20 shifts to the inference processing for determining gender, when
25 determining that the extracted person is an adult (YES in step S15, S16). In this inference processing, the CPU 20 calculates information on length of persons'

hair and person's build (balance of shoulders, breasts, hips, and legs or whole body line) to determine whether or not the extracted person is an adult female based on the calculation results (step S17).

5 When determining that the extracted person is an adult male, the CPU 20 shifts to the normal reproduction output processing with respect to the stream data (NO in step S17, S21).

10 On the other hand, when determining that the extracted person is an adult female, the CPU 20 shifts to processing to determine whether or not the image corresponds to the prohibition object data pattern (adult image) (YES in step S17, S18). Here, the CPU 20 determines whether or not the image is the adult image
15 based on data (data for determining the reproduction prohibition object data pattern) indicating the reproduction prohibition conditions stored beforehand in the database 22.

20 In the determining processing, the CPU 20 uses information indicating whether or not the color of the whole body is identical or similar to that of the face, the presence/absence of protrusions in a portion corresponding to the breasts (can be determined based on a frequency), or a position of a portion having a
25 color different from the skin color as reproduction prohibition condition data.

 In short, the CPU 20 determines whether or not the

image corresponding to the identified adult female is the adult image based on the presence/absence of clothing or a ratio of a portion corresponding to the clothing over the whole body. When presuming that the data meets the reproduction prohibition condition data and presuming complete nudity or a half clothed state, the CPU 20 determines that the image is the adult image (YES in step S19). On the other hand, for a person who wears swimsuits, the CPU 20 determines that the reproduction prohibition conditions are not matched, and shifts to usual reproduction processing (NO in step S19, S21).

When determining that the image of the extracted person is the adult image (prohibition object data pattern) by the above-described inference processing, the CPU 20 executes a predetermined reproduction control as described above (step S20). Concretely, the CPU 20 removes the data corresponding to the adult image from the received stream data VS, and transfers the stream data to the NTSC circuit 17.

As described above, in accordance with the present embodiment, when the image of the person extracted from the stream data is identical or similar to an image having a predetermined state (i.e., the image assumed to be an adult image), the CPU 20 can prohibit the display/output of the image of the person. Additionally, the CPU 20 determines whether or not the image of

the person is an adult image based on the reproduction prohibition condition data stored in the database 22. Therefore, naturally determining criteria differ with the content of the reproduction prohibition condition data.

(Third Embodiment)

FIG. 4 is a block diagram showing the constitution of a system to which the data reproducing apparatus of a third embodiment is applied.

A digital recording/reproducing system 400 of the present embodiment includes a hard disk drive (HDD) 40 as recording media. The present system 400 records AV content data transferred, for example, via a home LAN 41 in the HDD 4, and extracts designated AV content data from the HDD 40 in response to a reproduction request to reproduce/output the data.

The data reproducing apparatus of the present embodiment extracts the designated AV content data from the HDD 40 in response to the reproduction request to temporarily store the data in a buffer memory 42. A decoder 43 restores the data stored in the buffer memory 42 (processing for extending the compressed data), and stores the data in a field memory 44..

A CPU 45 determines whether or not the data stored in the field memory 44 has the reproduction prohibition object data pattern (also including an adult image) in the same manner as in the first embodiment. When it is

determined that the data pattern is identical or similar to that of the reproduction prohibition object by the determining result, the CPU 45 removes the corresponding data from the AV content data stored in the buffer memory 42.

By this processing, the data reproducing apparatus executes correction processing in the buffer memory 42 to remove the data corresponding to the prohibition object data pattern from the reproduction object data extracted from the HDD 40. The data reproducing apparatus transfers the reproduction object data subjected to the correction processing to the NTSC circuit 17 via the decoder 43 and field memory 44.

As described above, in short, in accordance with each embodiment, data having the same data pattern as or a data pattern similar to that set beforehand as the reproduction prohibition object can be removed from the digital data which is the reproduction object especially in the data reproducing apparatus for reproducing/outputting the AV content data. Therefore, it is possible to remove an image unfavorable from an educational standpoint or an unpleasant image (e.g., flash video) from the screen data displayed/output on the display screen beforehand, or to change the unfavorable or unpleasant image to another image beforehand.

Additional advantages and modifications will

readily occur to those skilled in the art. Therefore,
the invention in its broader aspects is not limited to
the specific details and representative embodiments
shown and described herein. Accordingly, various
5 modifications may be made without departing from the
spirit or scope of the general invention concept as
defined by the appended claims and their equivalents.